

TESS

Current Status

George Ricker
TESS PI

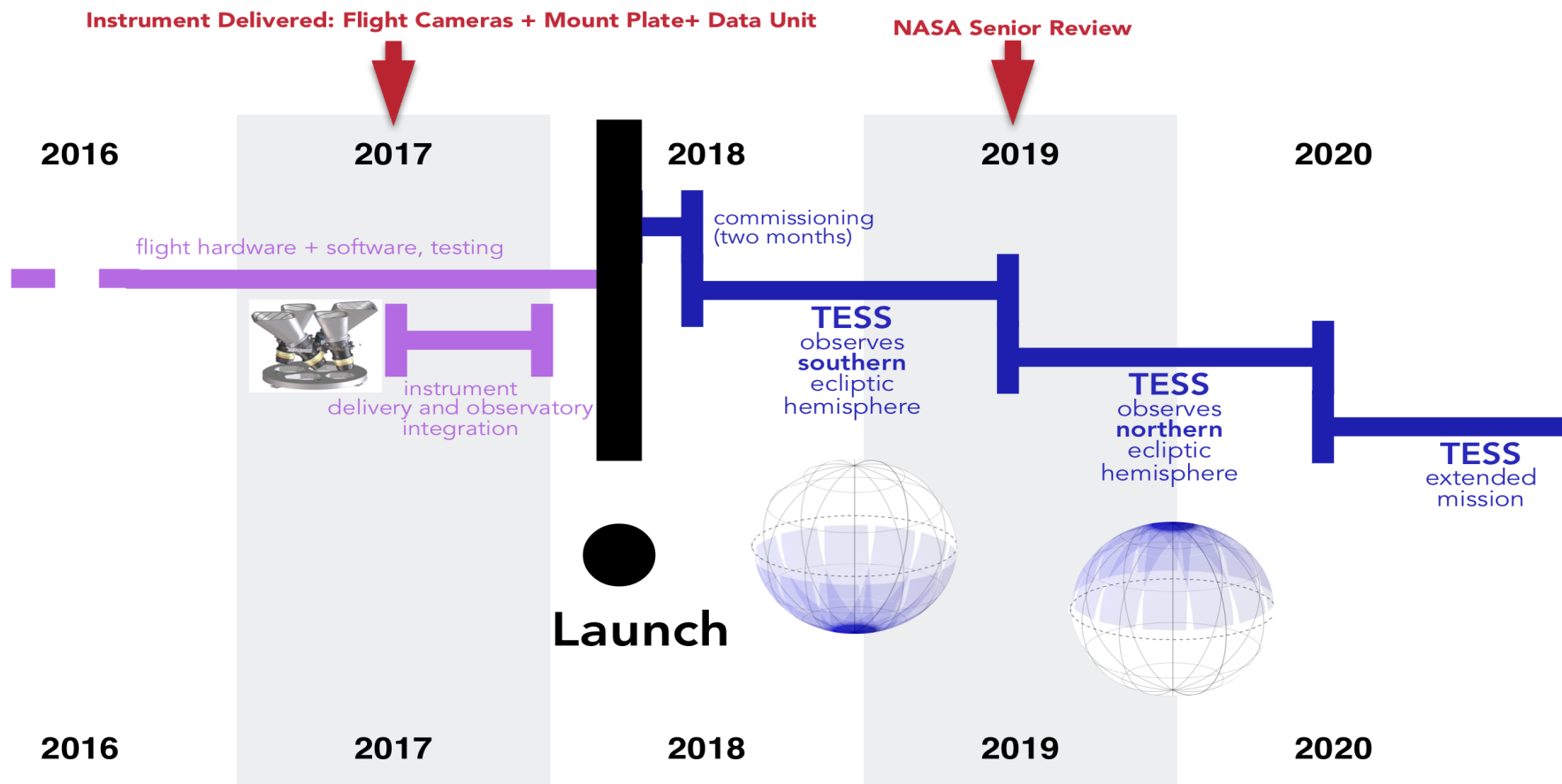
Jeff Volosin
TESS PM

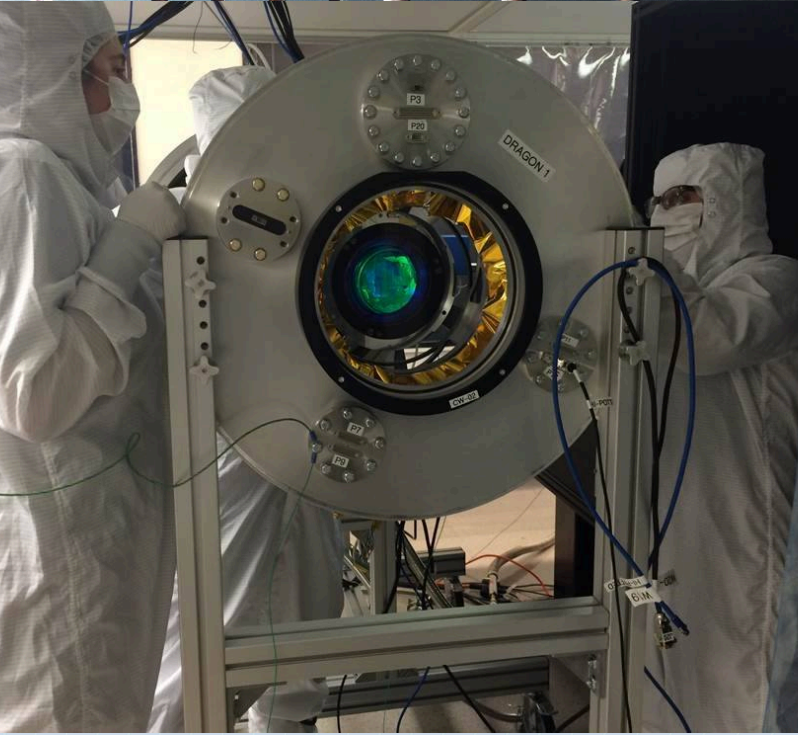
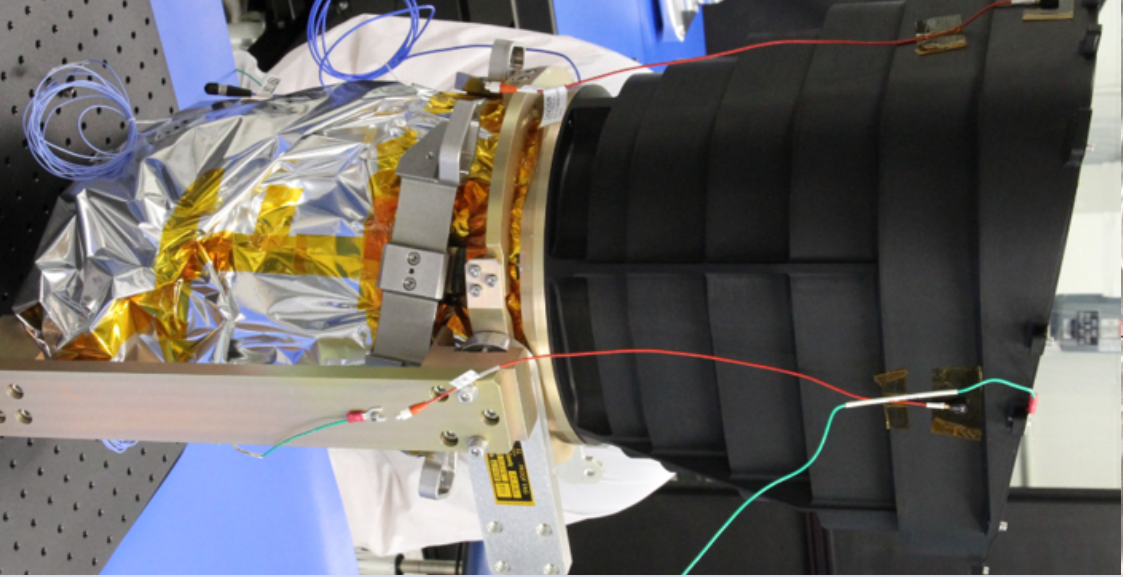
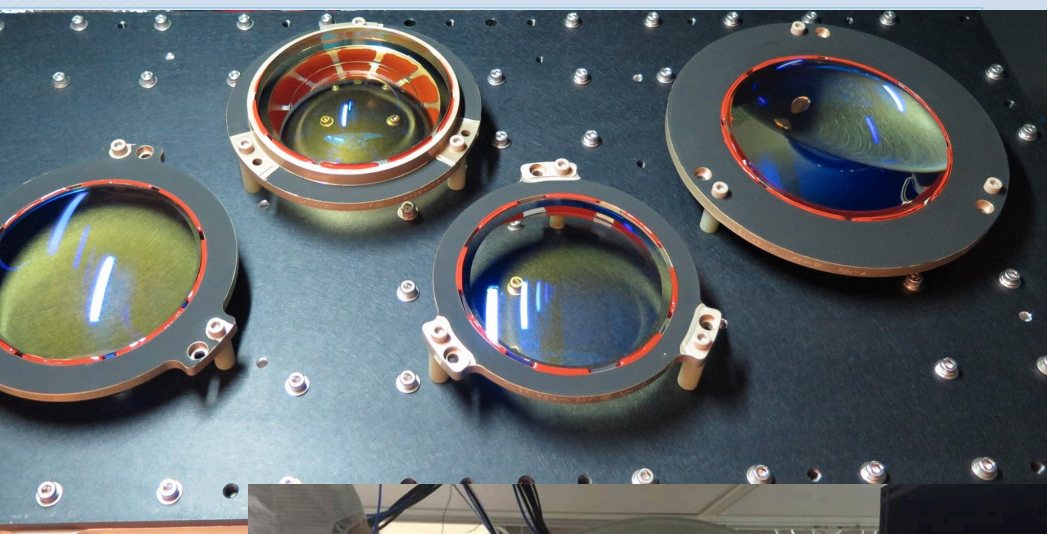
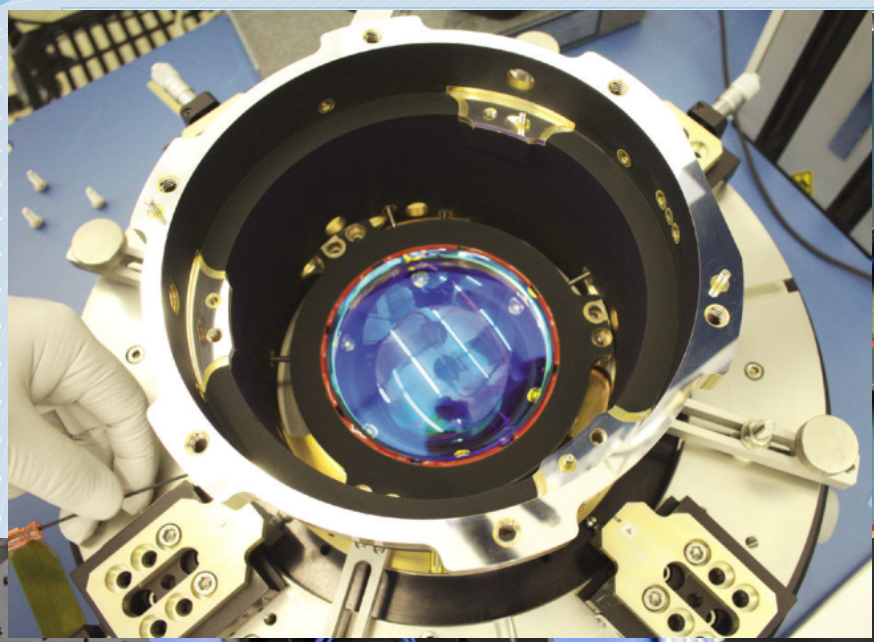
19 July 2017
NASA HQ

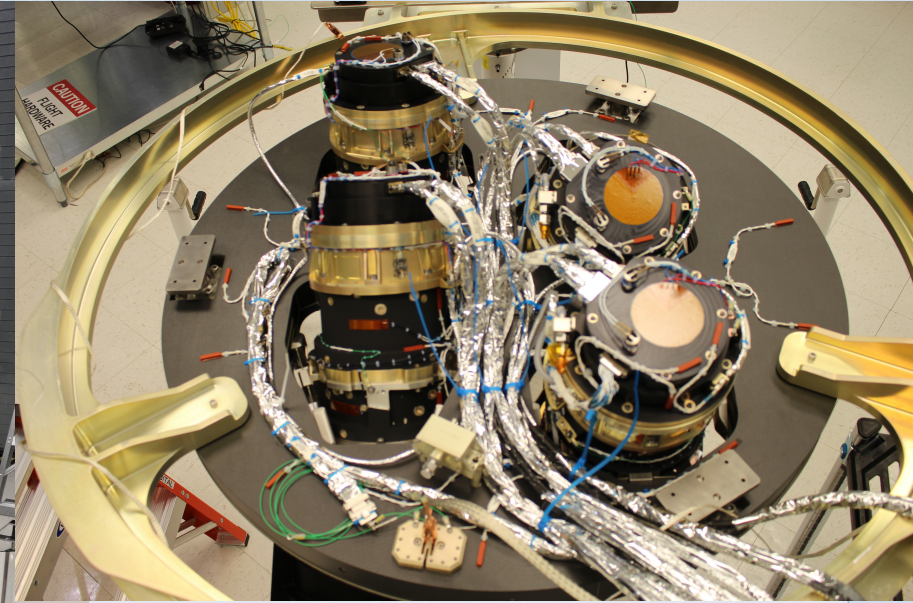
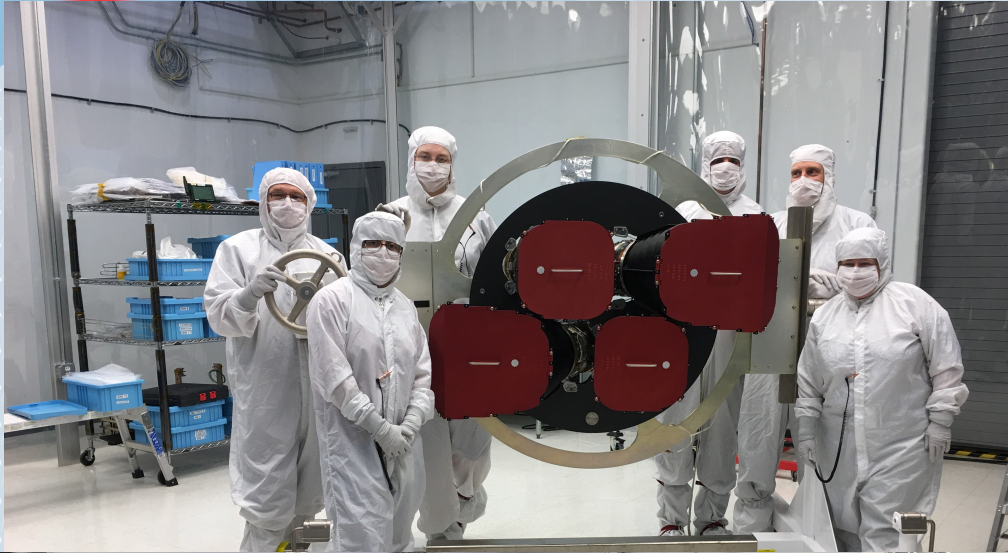
- ◆ Astrophysics MIDEX mission
- ◆ Lead institution is MIT
 - *GSFC mission management*
 - *Orbital ATK spacecraft*
- ◆ Launch NET March 20, 2018
- ◆ 2-year nominal mission
- ◆ Core Science: Discovery of small exoplanets orbiting bright, nearby stars
 - *Measure masses of 50 small planets*
- ◆ Guest Investigator Program to support broad range of community science



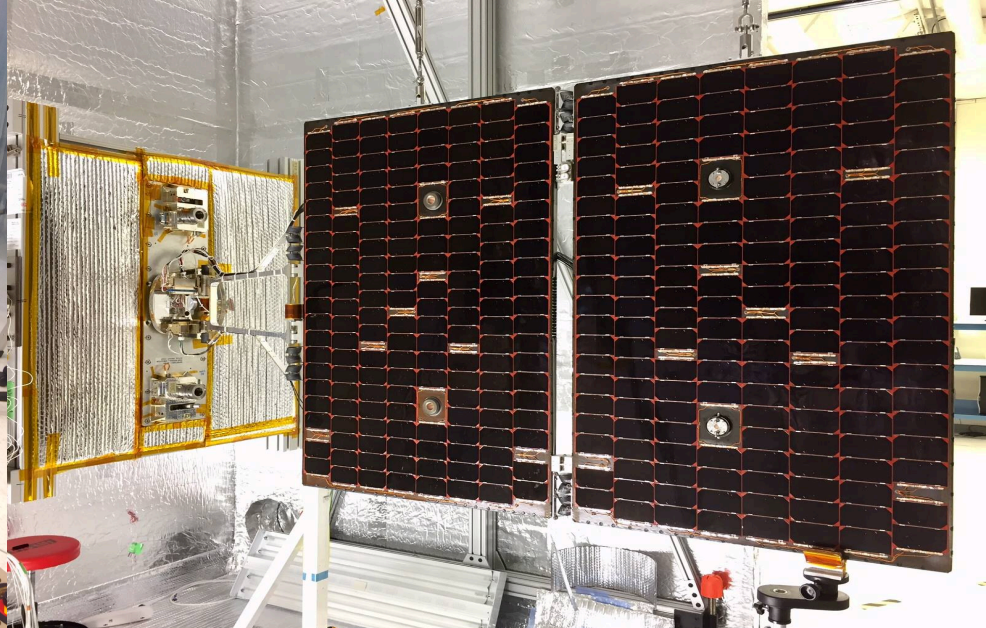
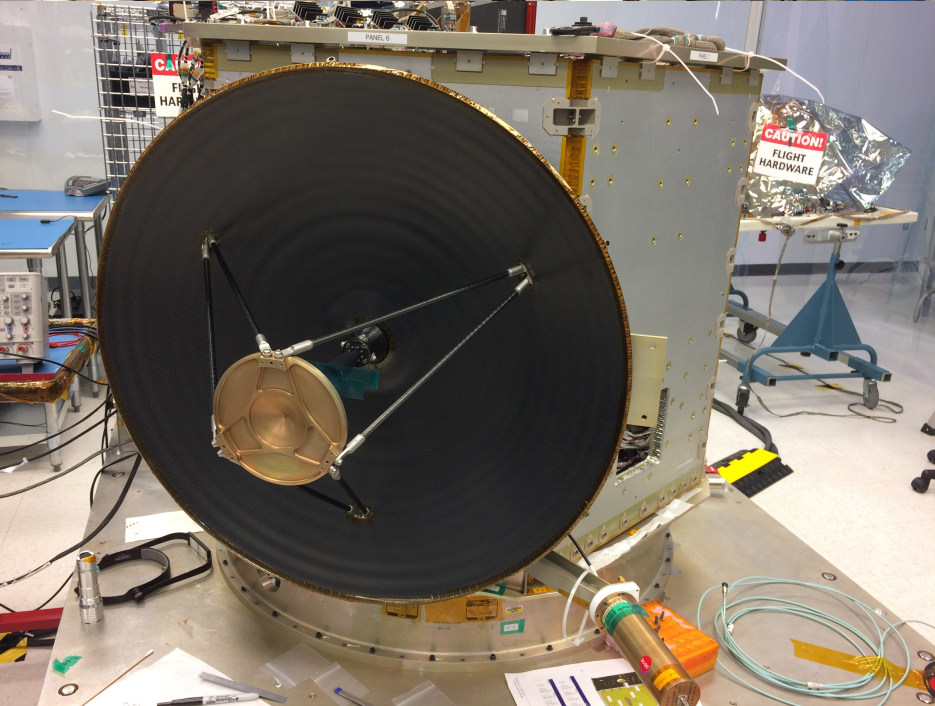
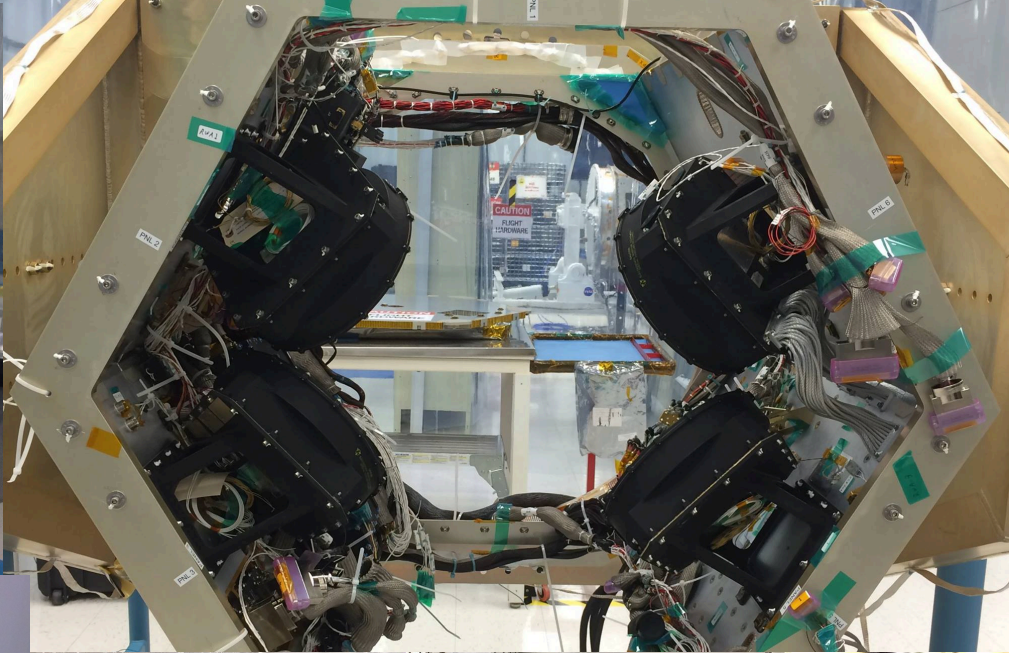
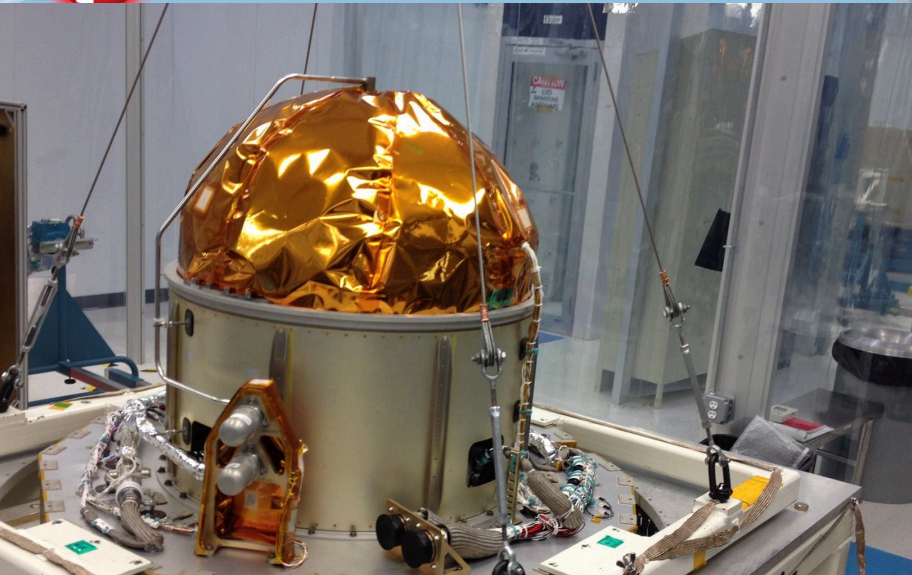
TESS timeline:





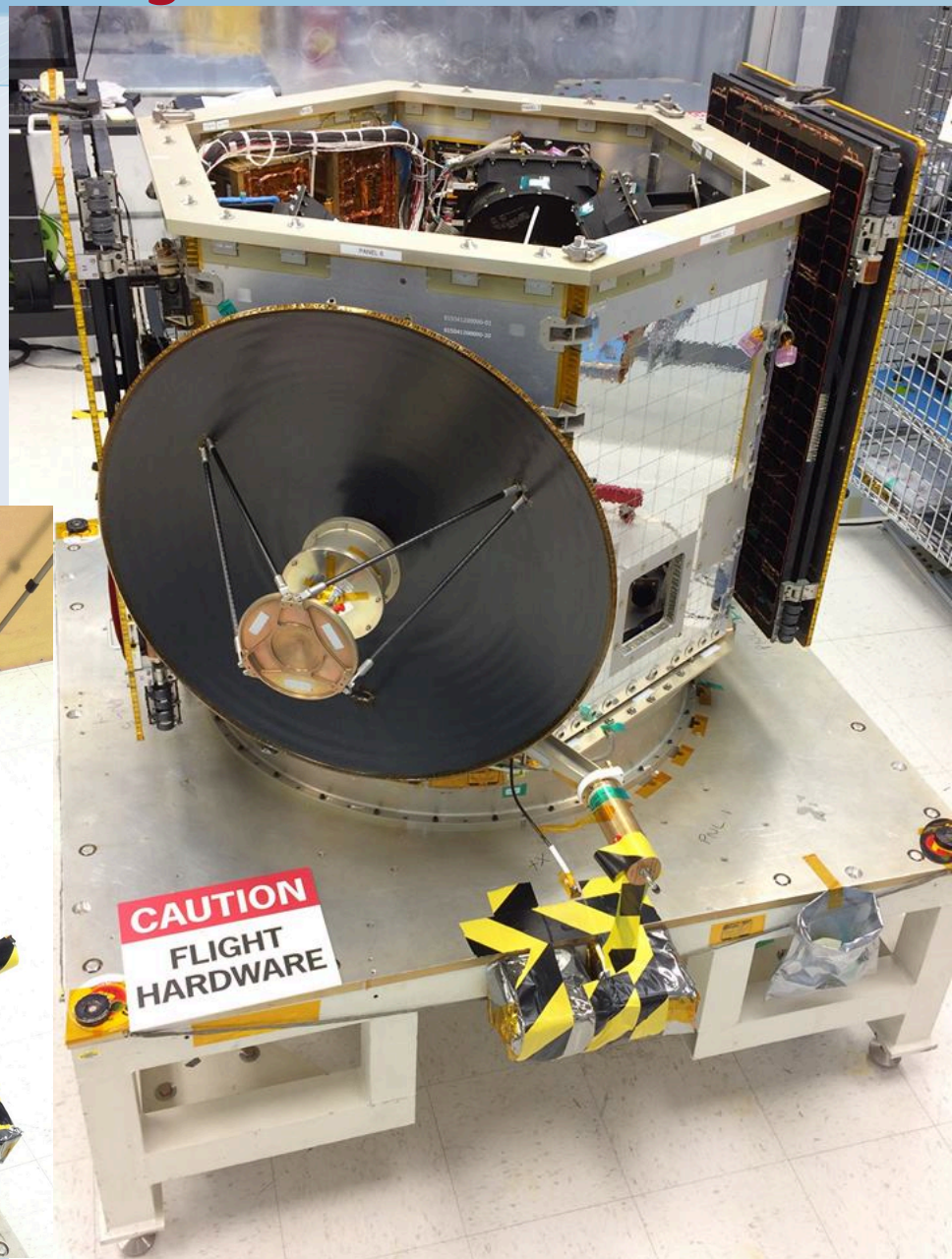


- Cameras installed on camera plate, harnessing and staking complete
- Data Handling Unit integrated and tested with cameras
- MLI installation scheduled for this week.
- Instrument integration to the observatory scheduled to occur within ~1 week.



Integration of the LEOStar-2 spacecraft components, at Orbital ATK's Dulles facility, is nearly complete

- One late component, the Ka-Band Transmitter, has a flight-like Engineering Unit “surrogate” standing in until the flight unit arrives

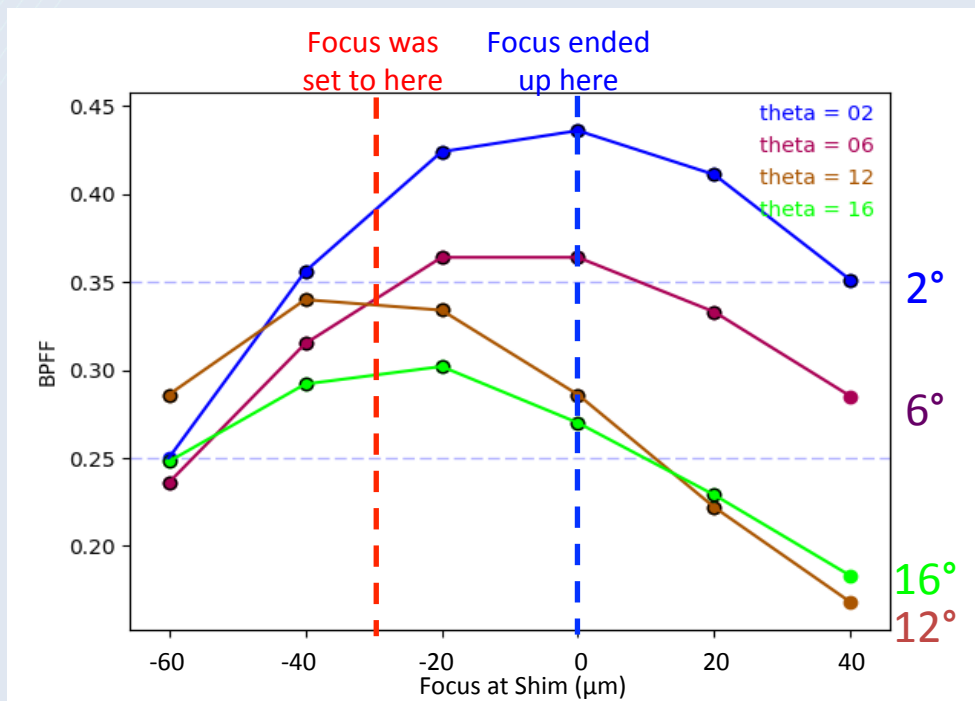


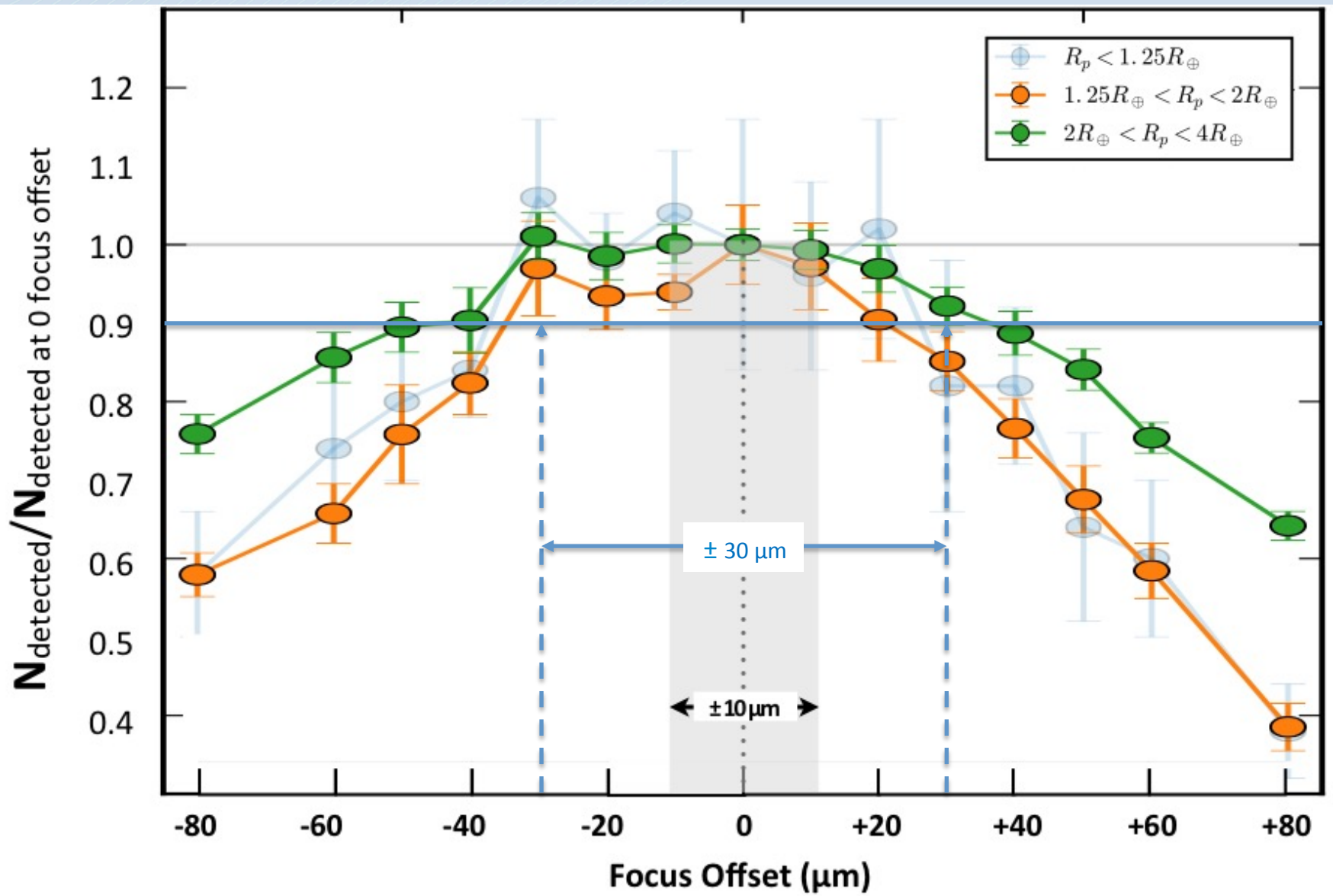
- ◆ All four cameras were focused based on Brightest Pixel Flux Fraction (BPFF) performance
 - *Area-weighted mean of best focus across FOV*
- ◆ The focus was seen to drift after ~1 week at flight temperatures (-75°C)
 - *Drift is faster at -85°C*
- ◆ Focus drift was seen to slow after a few days at -85°C
 - *Apparently stable*
 - *Focus drift ~20-30 μm across cameras*
 - *Compare to target focus precision of $\pm 10 \mu\text{m}$*
- ◆ Source of focus drift likely found
 - *Partial crystallization of RTV bond pads at low temperatures*
- ◆ Extended tests with flight spare camera will inform how best to handle cameras in flight
 - *Camera temperature, temperature drift rate, etc.*

- ◆ Meeting held with Paul Hertz and NASA HQ on June 9th
 - *Decision made to move forward with TESS cameras “as is”*
 - *RTV rubber bond pads are very likely the root cause of defocus drift*
 - *TESS Level 1 science requirements will be met*
 - *Exoplanet yields on Earths & super-Earths will be impacted by ~10% – 20%*

- ◆ Ongoing studies
 - *Investigation of root cause will continue at MIT/LL and Goddard*
 - *Flight spare camera will be tested extensively over ~ 6 months at MIT/MKI to establish:*
 - *Optimal operating temperatures*
 - *Impacts of thermal “pulse” at perigee*

- ◆ Focus drift impacts outer part of FOV more, as measured by BPF
- *Initial focus balances inner ($<6^\circ$) and outer ($>12^\circ$) FOV performance*
- *Focus shift moves toward better focus for inner FOV*

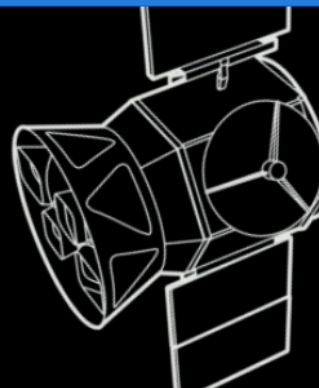
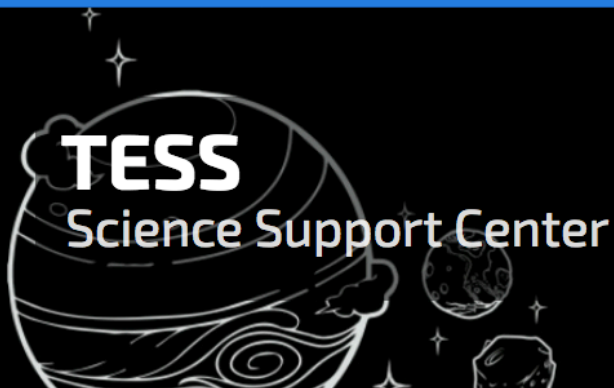




- ◆ Baseline Science Requirement 3:
 - *“The TESS Team shall assure that the masses of fifty (50) planets with radii less than $4R_{Earth}$ are determined.”*
 - *Will be met based on planets with the brightest host stars.*

- ◆ With nominal focus, TESS will detect ample planets around stars bright enough for mass measurement
 - *360 planets with $R < 4R_{Earth}$ with $I_{mag} < 10$*
 - *230 planets with $R < 4R_{Earth}$ with $V_{mag} < 10$*

- ◆ Ample margin for mass measurement
 - *Yield of these planets unaffected by the focus drift*



TESS mission

The Transiting Exoplanet Survey Satellite (TESS) is a two-year survey that will discover exoplanets in orbit around bright stars.

[More »](#)


Proposing science

The TESS Guest Investigator Program is an annual call where scientists can propose new observations and receive funding and support.

[More »](#)


Data access

Access simulated data, documentation, data analysis software, and find information on the follow-up observing program.

[More »](#)

TESS Guest Investigator Program

- ◆ Padi Boyd, NASA/GSFC, TESS GI Program Director



MIT KAVLI INSTITUTE

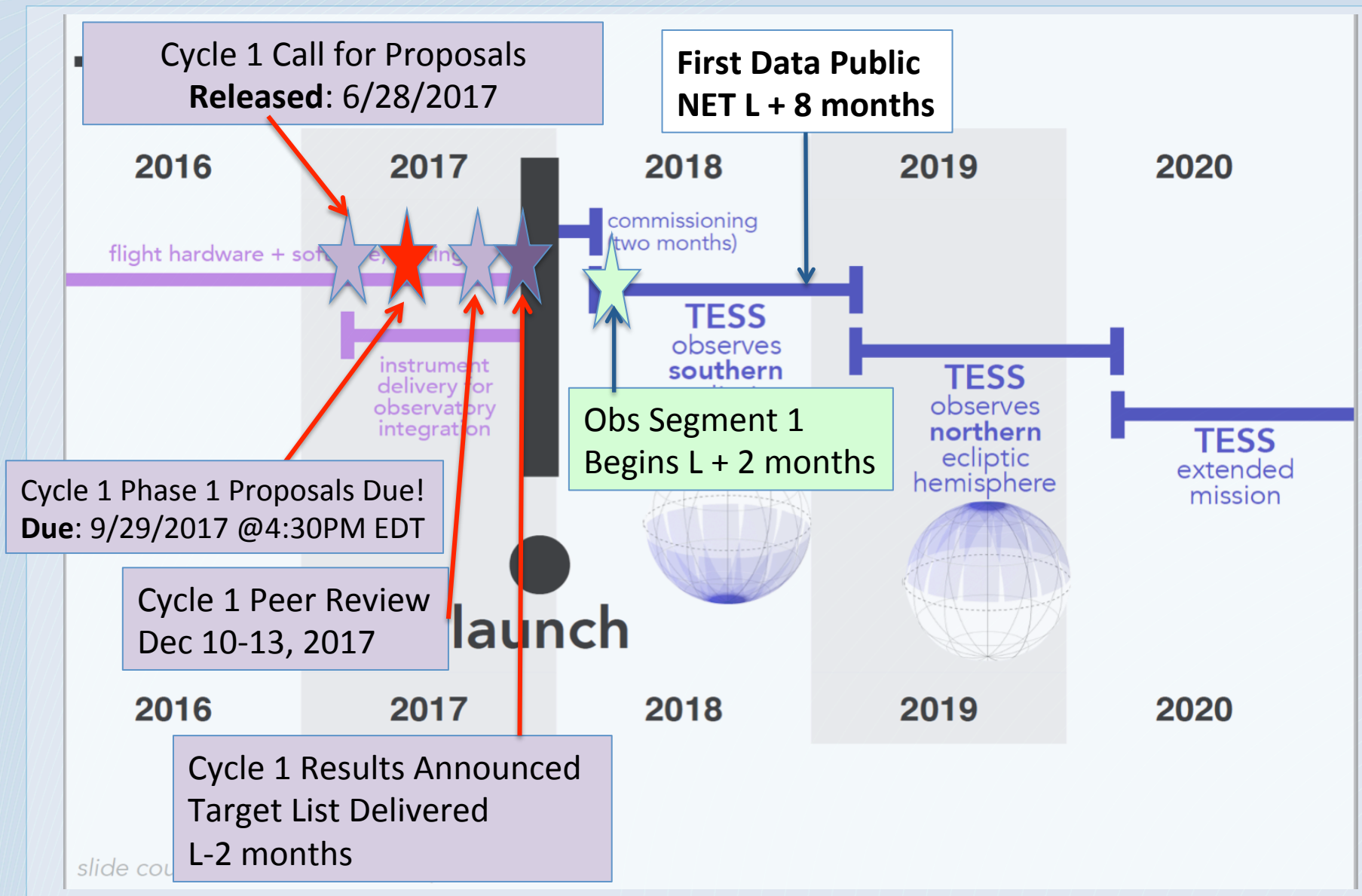


Goddard
SPACE FLIGHT CENTER

- ◆ Starts concurrently with the beginning of TESS Science Operations (L+60 days)
- ◆ Operates for the duration of primary mission (Cycle 1, Cycle 2)
- ◆ Solicits proposals from astronomical community for **new** investigations using
 - *2 min cadence data on ~10K new science **targets**/yr*
 - *30 min FFI data*
- ◆ As with all TESS data, no proprietary period for GI data
- ◆ Total funds available to PI's at US Institutions: \$2.5M/yr
- ◆ Work with TSO to make available and maintain necessary tools and documentation for data analysis

- ◆ Small and large proposal categories
 - *# targets, level of effort*
 - *Small ~\$50K, large ~\$200K*
- ◆ Two Phase proposal process (science first, then budget)
- ◆ TOO's allowed, must be clearly described, justified
- ◆ Proposal categories:
 - *New 2-minute exoplanet **targets***
 - *Exoplanet investigations using FFIs*
 - *Astrophysics investigations with 2-minute **targets***
 - *Astrophysics investigations with FFIs*
 - *Novel planet confirmation techniques or algorithms*
- ◆ Cycle 1 targets in first (S) hemisphere, funding for 1 year
- ◆ Cycle 2: same process, different hemisphere
- ◆ Cycle 3: Expected to continue with extended mission

Call for proposals, Observatory Guide, proposal planning tools see: <http://heasarc.gsfc.nasa.gov/docs/tess/>

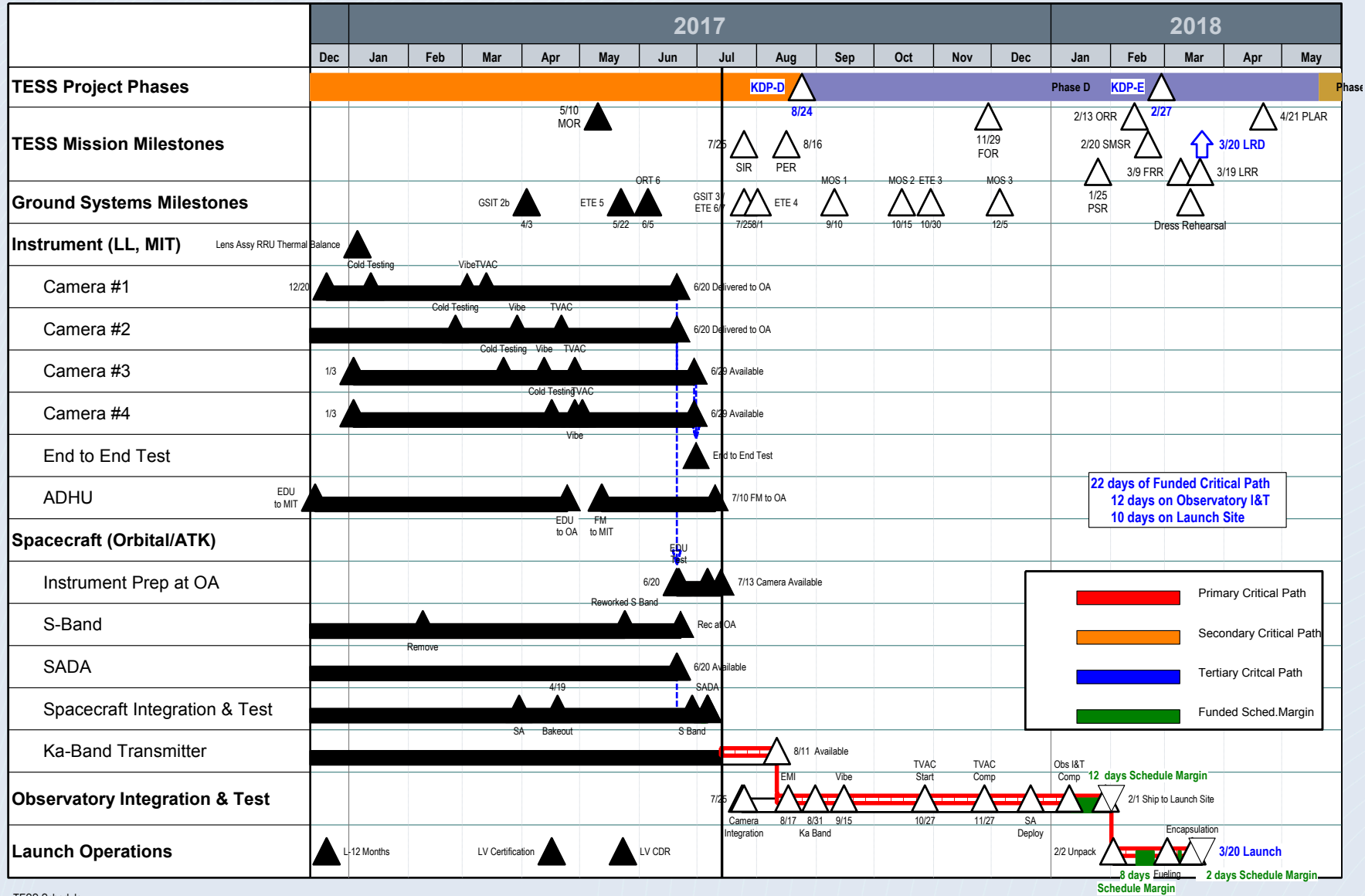




TESS Schedule Status

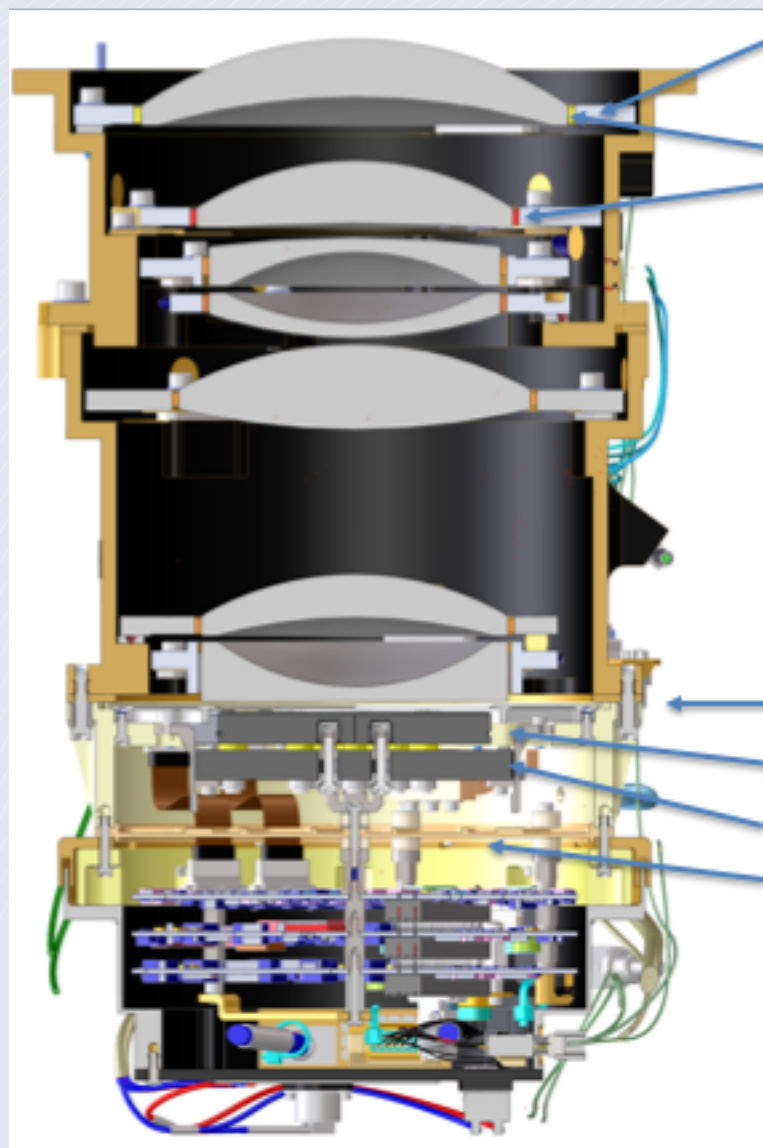
TESS Master Schedule

7/13/17



- ◆ Received funding to cover launch delay from December 2017 to March 2018 due to launch vehicle manifest changes
- ◆ Project remains on track for start of observatory testing in August 2017

Back Up Slides



Lenses in individual bezels

RTV bonds
lenses to bezels

Upper
Lens
Barrel

Lower
Lens
Barrel

Lens Assembly

Aluminum cold shim (used to set interface distance and wedge)

CCD Pedestals

CCD Mosaic Plate

Thermal isolation shield

Focal Plane
Electronics

Detector
Assembly